

University of Groningen

Development and description of controlled release formulations for use in powder detergents

Hartman Kok, Paul Jean Antoine

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version

Publisher's PDF, also known as Version of record

Publication date:

2000

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Hartman Kok, P. J. A. (2000). *Development and description of controlled release formulations for use in powder detergents*. s.n.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

1 *FREQUENTLY ASKED QUESTIONS (FAQ)*

1.1 *FAQ*

Why a FAQ?

This thesis is equipped with a Frequently Asked Questions section that has the purpose to be a guide to the reader to explain our train of thought and our method of approach. We do this because, as is seen in the title of the thesis, the thesis contains the development of a product i.e. it is largely product engineering (see the next paragraph). Product engineering is another type of research than “classical academic research”; i.e. the focus is more on the product or the result than on the fundamental understanding of the processes involved (although the latter can be of real help in optimising the product or process). Therefore, the presentation of the results might seem quite arbitrary to the reader and might give rise to questions. We hope to clarify this in this introduction.

What is product engineering?

The “products” in product engineering [1] are consumer products and chemical and pharmaceutical specialities such as paper, toothpaste, controlled release drugs, paint, detergents, etc. They have in common that they are structured, that they contain many substances (each with its own purpose), and that they are judged on performance, not on their composition. The product in this thesis is a product that, when dissolved in water, has a controlled release of the active ingredient it contains with properties suitable for use in a dry powder laundry detergent.

The engineering comprises everything that is necessary to design, develop, manufacture and market a product. It also involves technical and scientific understanding of the manufacturing process and properties of the product. In this thesis this involves understanding of granulation and coating techniques and understanding of dissolution and release mechanisms of the products in use.

How is the thesis set-up?

In chapter 2 a literature review of the existing controlled release formulations with a pulse release profile is given, especially those that are used or being developed in the pharmaceutical or detergent industry. From this

literature survey and our own preliminary experiments we found that the most suitable formulation for our purposes is a core containing the active ingredient surrounded by a coating which determines the release characteristics.

In chapter 3 the production methods of the formulations are discussed. The chapter is divided in 2 parts: the first part deals with the production of the core, and the second part deals with the application of the coating.

The next three chapters contain the description of the formulations developed. Chapter 4 describes the formulations with a coating that is completely water-soluble. Chapter 5 describes the formulations which have a coating that is partly water-soluble and partly water-insoluble. Finally, chapter 6 describes the formulations with coatings that are water-insoluble.

Why are the results split-up in chapters with varying degrees of water-solubility of the coating?

The behaviour of the coating when immersed in water (dissolution, swelling etc) is the main parameter that determines the release characteristics of the formulation.

The choices of materials for the formulations seem a bit arbitrary sometimes, why is this?

The development of a new product is for a large part based on ideas and intuition. Ideas and intuition are not the most structured things in the world; therefore the choices of materials and methods of production might seem a bit arbitrary sometimes. Also before a formulation “works” almost always some preliminary experiments have been carried out leading to the formulation described. Most of these preliminary experiments were left out of the thesis thus some results seem to be coming out of nowhere.

So not all the results are included in the thesis, which results are included and which not?

Not all the formulations described in this thesis give the desired release profile. If unsuccessful formulations are included they are included to give a better understanding of the release mechanisms involved for that type (type of water solubility behaviour) of coating. Or they are simply included because it will prevent any person interested in this type of controlled release formulations to make the same mistakes we did.

The results we did not include in this thesis were formulations that did not give the desired result because we were not able to overcome the technical difficulties involved to produce the formulations. Examples are particles with insoluble coatings, with swelling particles dispersed in this coating to induce rupture, and various formulations with as a coating a polymer which produces a high viscosity aqueous solution. Although the principle according to which

these formulations function might be appropriate we were not able to produce these formulations and therefore we did not include the results.

Are the formulations developed in this thesis ready to be implemented in an actual existing detergent?

Before the formulations can be used in an actual detergent additional work has to be done. For instance the release experiments in this thesis are all conducted in water of 25 °C, in reality the water in a washing machine has a temperature profile ranging from about 15 °C to 60 °C. Also not accounted for during release experiments are pH changes in the washing water, and influence of other components present in the washing water such as surfactants and calcium ions. The reason to chose for simplified release experiments was to minimise the number of parameters during the experiments. Accounting for all the available parameters present during a washing process (pH, temperature, ionic strength, water-flow velocities) in the release experiments would have made the experiments very complicated and time-consuming.

Furthermore there is still uncertainty on what the ideal controlled release profile (see paragraph 2.5.1) of the components in a dry powder detergent should be. Already assuming a certain controlled release profile in terms of concentration, temperature and pH would be premature.

Concluding; this thesis should be seen as a guide to develop a controlled release product suitable for use in a dry powder detergent or any other application in which the properties of the developed products are desirable. It will give an insight in the release mechanisms involved, the materials to be used and the production techniques involved.

So this project is probably sponsored by a detergent producing company?

This project is indeed sponsored by Unilever Research Laboratories Vlaardingen. It is part of a larger programme of activities, the main goal being a decrease of the amount of waste produced by the use of detergents. To reach this goal a better understanding of the washing process and the optimisation of the ingredients of the detergents are the main targets in the activities.

1.2 References

- [1] The definition of product engineering is taken from the report “Product Engineering” which describes the set-up of a new curriculum “Product Engineering” at the university of Groningen. The main author is Professor Wesselingh, the report is dated June 1999.

